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Abstract

STUDY OF NEW STRUCTURES ADAPTED TO GAS-GRAPHITE AND GAS-HEAVY-WATER REACTORS

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The experience acquired as a result of the operation of the MARCOULE reactors and of the construction and start-up of the E.D.F. reactors on the one hand, and the conclusions of research and tests carried out out-of-pile on the other hand, lead to a considerable change in the general design of reactors of the gas-graphite type.

The main modifications envisaged are analysed in the paper. The adoption of an annular fuel element and of a down-current cooling will make it possible to increase considerably the specific power and the power output of each channel ; as a result there will be a considerable reduction in the number of the channels and a corresponding increase in the size of the unit cell. The graphite stack will have to be adapted to there new conditions. For security reasons, the use of prestressed concrete for the construction of the reactor vessel is becoming more widespread ; they could lead to the exchangers and the fuel-handling apparatus becoming integrated inside the vessel (the so-called "attic" device). A full-size model of this attic has been built at Saclay with the participation of EURATOM ; the operational results obtained are presented as well as a new original design for the control rods.

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As for as the gas-heavy-water system is concerned, the research is carried out on two points of design ; the first, which retains the use of horizontal pressure tubes, takes into account the experience acquired during the construction of the EL 4 reactor of which it will constitute an extrapolation ; the second, arising from the research carried out on the gas-graphite system, will use a pre-stressed concrete vessel for holding the pressure, the moderator being almost at the same pressure as the cooling fluid and the fuel being placed in vertical channels.

The relative merits of these two variants are analysed in the present paper.